Claims

1. Process for detecting analytes or binding reactions, in which ferromagnetic or ferrimagnetic substances are used as labeling in immunoassays or other binding assays, characterized in that the relaxation of the double refraction is determined as a measurement variable.

2. Process for detecting analytes or binding reactions, in which ferromagnetic or ferrimagnetic substances are used as labeling in immunoassays or other binding assays, wherein the double refraction in the frequency range is determined as a measurement variable.

3. Process for detecting analytes or binding reactions according to claim 1 or 2, wherein ferromagnetic or ferrimagnetic substances are used as labeling in immunoassays or other binding assays, wherein the Brownian relaxation in at least a part of these substances proceeds faster than the Néelian relaxation under the measuring conditions.

4. Process for detecting analytes or binding reactions, wherein

(i) the structure-specific substances that bind the analytes are labeled first with ferrimagnetic and ferromagnetic substances and then

(ii) these labeled structure-specific substances are used in a sample that is to be measured,

(iii) the sample that is to be measured is magnetized with a magnetic field that is applied from the outside, and

(iv) after the external field is turned off, the relaxation of the double refraction of the magnetic marker is measured.

5. Process for detecting analytes or binding reactions, wherein

(i) analytes first are labeled with ferrimagnetic or ferromagnetic substances, and then

(ii) these magnetically labeled analytes are used in a sample that is to be measured, to which substances were added that specifically bind the analytes, and

(iii) the sample that is to be measured is magnetized with a magnetic field that is applied from the outside, and

(iv) after the external field is turned off, the relaxation of the double refraction of the magnetic marker is measured.

6. Process for detecting analytes that are present in the liquid phase, wherein

(i) the structure-specific substances that bind the analytes are labeled first with ferrimagnetic and ferromagnetic substances, whereby the Brownian relaxation in at least a part of these substances has a shorter relaxation time than the Néelian relaxation under the measuring conditions, and then

(ii) these magnetically labeled substances are used in a sample that is to be measured,

(iii) the sample that is to be measured is magnetized with a magnetic field that is applied from the outside, and

(iv) after the external field is turned off, the relaxation of the double refraction of the magnetic marker is measured, whereby the varying relaxation behavior of the magnetic markers that are bonded to the analytes compared to the unbonded magnetic markers is used for analysis.

7. Process for detecting analytes that are present in the liquid phase, wherein

(i) analytes are labeled first with ferrimagnetic and ferromagnetic substances, whereby the Brownian relaxation in at least a part of these substances has a shorter relaxation time than the Néelian relaxation under the measuring conditions, and then

(ii) these magnetically labeled analytes are used in a sample that is to be measured, to which substances were added that specifically bind the analytes, and

(iii) the sample that is to be measured is magnetized with a magnetic field that is applied from the outside, and

(iv) after the external field is turned off, the relaxation of the double refraction of the magnetic marker is measured, whereby the varying relaxation behavior of the magnetic markers that are bonded to the analytes compared to the unbonded magnetic markers is used for analysis.

8. Process according to claim 6, wherein in addition, the substances that specifically bind the analytes were added to the samples that are to be measured.

9. Process according to claims 4 to 8, wherein the measurement of the double refraction in the frequency range is used for detection instead of measurement of the relaxation of the double refraction.

10. Process according to claims 1 to 9, wherein the structure-specific substances are antibodies, antibody fragments, biotin, or substances that specifically bind biotin such as avidin or streptavidin, neutravidin or extravidin, agonists that bind specifically to receptors or their antagonists, specific peptides and proteins, receptors, enzymes, enzyme substrates, nucleotides, ribonucleic acids, deoxyribonucleic acids, carbohydrates, or lipoproteins.

11. Process according to claim 10, wherein the agonists that bind to receptors are cytokines, lymphokines, or endothelins.

12. Process according to claims 10 and 11, wherein the structure-specific substances have a binding constant in the range of 10^5-10^{15} $(mol/l)^{-1}$.

13. Process according to claims 1 to 12, wherein a determination of two or more different analytes in a sample is made.

14. Process according to claim 13, wherein two or more ferromagnetic or ferrimagnetic substances wtih Brownian relaxation times that can be discriminated are used.

15. Process according to claims 1 to 14, wherein the ferromagnetic or ferrimagnetic substances have a particle size in the range of 1 nm to 100 μm.

16. Process according to claims 1 to 14, wherein the ferromagnetic or ferrimagnetic substances are stabilized with a shell that consists of oligomeric or polymeric carbohydrates, proteins, peptides, nucleotides and/or lipids.

17. Use of compounds that consist of combinations of ferromagnetic or ferrimagnetic substances with structure-specific substances for detection of analytes or binding reactions using measurement of the relaxation of the double refraction or using measurement of the double refraction in the frequency range.

18. Use of compounds that consist of combinations of ferromagnetic or ferrimagnetic substances with substances that are to be identified for detection of binding reactions using measurement of the relaxation of the double refraction or using measurement of the double refraction in the frequency range.

19. Use of compounds that consist of combinations of ferromagnetic or ferrimagnetic substances with structure-specific substances, whose Brownian relaxation proceeds faster than the Néelian relaxation under the measuring conditions for detection of analytes or binding reactions using measurement of the relaxation of the double refraction or using measurement of the double refraction in the frequency range.

20. Use of the compounds that consist of combinations of ferromagnetic or ferrimagnetic substances with substances that are to be identified, whose Brownian relaxation proceeds faster than the Néelian relaxation under the measuring conditions for detection of binding reactions using measurement of the

relaxation of the double refraction or using measurement of the double refraction in the frequency range.

21. Use of the compounds in the process according to claims 1 to 14, wherein the compounds contain ferromagnetic or ferrimagnetic substances, whose particle size lies in the range of 1 nm to 100 μm.

22. Use of compounds in the process according to claims 1 to 14, wherein the compounds contain ferromagnetic or ferrimagnetic substances that are stabilized with a shell that consists of oligomeric or polymeric carbohydrates, proteins, peptides, nucleotides, surfactants, polymers and/or lipids.

23. Use of the compounds in the process according to claims 1 to 14, wherein the compounds contain structure-specific substances, which are antibodies, antibody fragments, biotin, or substances that bind biotin such as avidin or streptavidin, agonists that bind specifically to receptors or their antagonists, specific peptides and proteins, receptors, enzymes, enzyme substrates, nucleotides, ribonucleic acids, deoxyribonucleic acids, carbohydrates, or lipoproteins.

24. Use of the process according to claims 1-16 in fertility, histocompatibility, allergology, infectiology, hygiene, genetics, virology, bacteriology, toxicology, pathology, environmental analysis, food chemistry and medical diagnosis.

25. Use of combinations of ferrimagnetic or ferromagnetic substances with structure-specific substances or combinations of ferrimagnetic or ferromagnetic substances wtih analytes that are to be identified in the process according to claims 1-16.

26. Use of a device for implementing the process according to one of claims 1 to 16, wherein the device contains a device for producing polarized light, a device for receiving the sample, a device for magnetizing the sample with magnetic pulses or a magnetic field of variable frequency, as well as a device for analysis of the polarization direction of polarized light.

27. Use of a device according to claim 26, wherein a laser, a polarizer, an optical cell with the sample, an analyzer and a photodetector are arranged on an optical bank.

28. Use of a device according to claim 26 or 27, wherein in addition, a $\lambda/4$-plate is between the sample and the analyzer.